

# THERAPEUTIC FOODS FOR THE LIVER

## Introduction

The liver is the largest solid internal organ of the body. The liver processes blood, stores and creates nutrients, and produces bile which is necessary for a healthy gut microbiome and nutrient absorption. Last but not least: the liver helps with detoxification. The liver takes care of us! And this is how you protect and help the liver.

## Note

A lot of the research in this area is done on animals with fundamentally similar liver structures to humans. Human studies are hard to find since a lot of this research won't pass ethical committees. Often to examine the healing effect of food compounds, liver toxic substances are given to animals. An example is the toxin carbon tetrachloride (a chemical used in fire extinguishers and refrigerators before 1970). It is interesting how many of the researched foods contain compounds that aren't vitamins or minerals but also have other health benefits for humans. This stresses the importance of eating whole foods for general health.

## Banana

**Parts used in research:** ripe and unripe fruits

**Liver-toxic substances used in research:** paracetamol

The increased liver marker enzymes due to paracetamol-induced liver injury were observed to reduce in serum when bananas were 'supplemented'. Bananas can help to heal the liver to their content of phytochemicals such as phenolics compounds, alkaloids, coumarins, flavonoids and lignans.



## Beetroot

**Parts used in research:** roots and leaves

**Liver-toxic substances used in research:** Carbon tetrachloride

Beetroot and its leaves contain flavonoids, carbohydrates, betaine, neobetain and anthocyanin pigments and pigments called Betalains. Betanin, which is one specific betalain found in beets, stimulates liver cells to produce a protein called Nrf2 that stimulates the cell to produce antioxidants like Glutathione.

PMID: [32957510](https://pubmed.ncbi.nlm.nih.gov/32957510/)

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## Blueberries/Cranberries

**Parts used in research:** fruit

**Liver-toxic substances used in research:** Alcohol

Blueberries and cranberries are rich in a type of antioxidants called flavonoids. The most famous and most studied ones are called anthocyanins. Anthocyanins are colorful pigments that may appear red, purple, blue or black. Anthocyanins have been shown to reduce inflammation and protect the liver against damage from oxidative stress.

PMID: [25356040](#)



## Cactus Fruit (also called Prickly Pear)

**Parts used in research:** fruit

**Liver-toxic substances used in research:** Alcohol

Different studies done on European and Asiatic prickly pear varieties have demonstrated antioxidant activities. Besides vitamin C, vitamin E, polyphenols and carotenoids, prickly pear is also a source of kaempferol, quercetin and taurine. Some studies also showed that prickly pear was protective against the damaging effects of the carcinogen aflatoxin and the liver-damaging insecticide called chlorpyrifos.

PMID: [25356040](#)



## Cabbage

**Parts used in research:** leaves

**Liver-toxic substances used in research:** Simvastatin (Statin)

A few studies found that cabbage had liver-protective properties. This may be due to the presence of alkaloids, amino acids, carbohydrates, flavonoids, glycosides, phenols, proteins, saponins, steroids, tannins and terpenoids in the cabbage extracts that have been used.



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## Calabash (Bottle Gourd)

**Parts used in research:** Fruits

**Liver-toxic substances used in research:** carbon tetrachloride, Rifampicin (antibiotics)

It is thought that the breakdown intermediate of carbon tetrachloride is causing damage to liver cells. What happens is that the CYP liver enzymes that are used in detoxification processes create intermediates that in this case are even more toxic. Calabash inhibits the production of some of these CYP enzymes, making the detoxification process safer.



## Carrots

**Parts used in research:** root and leaves

**Liver-toxic substances used in research:** carbon tetrachloride, alcohol, paracetamol, Isoniazid and lindane (neurotoxin).

Elevated serum enzyme levels were reduced by carrot extracts in a dose-responsive way. This simply means that the more extract was used, the more the enzymes were reduced. The compounds in carrots that are protecting the liver are namely phenolics, carotenoids, polyacetylenes, and ascorbic acid

PMID: [31546950](#)



## Curcumin seeds

**Parts used in research:** seeds

**Liver-toxic substances used in research:** Profenos (an organophosphate pesticide)

An essential oil extract of cumin lowered the elevated levels of enzymes (ALT, AST, SGPT and SGOT) that increase when the liver is damaged. Cumin powder was also able to restore reduced glutathione, catalase and superoxide dismutase levels. Terpenes, phenols and flavonoids are thought to be responsible for protecting the liver. Black cumin seeds are particularly rich in a phytochemical called 'thymoquinone' which helps protect the liver.

PMID: [33100788](#)



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## Curry leaves

**Parts used in research:** leaves

**Liver-toxic substances used in research:** Alcohol

The tannins and the carbazole alkaloids found in curry leaves have been shown to reduce cellular damage to liver cells. Curry leaves can help the liver to produce more glutathione, catalase and superoxide dismutase (SOD) with alcohol poisoning. In research, the protection offered by curry leaves was comparable to the protection of a drug (l-ornithine l-aspartate or LOLA for short)



## Coffee

**Parts used in research:** seed

**Liver-toxic substances used in research:** not available

Coffee protects the liver in different ways. The liver can convert excess carbohydrates into fatty acids via a process called 'de novo lipogenesis'. Caffeine and chlorogenic acids (2 components in coffee) can inhibit this process. Chlorogenic acids reduce oxidative stress by activating Nrf2. When you activate your Nrf2 pathway your body creates more antioxidant proteins like glutathione. Furthermore, cafestol and kahweol induce phase II detoxification  
PMID: [28124992](#) PMID: [25291138](#)



## Coriander

**Parts used in research:** seed

**Liver-toxic substances used in research:** lead nitrate

In research, lead was used to create liver damage. The elevated liver enzymes were significantly reduced by water and ethanol extracts of coriander. Ingredients in coriander such as linalool and glucosides (such as various  $\beta$ -D-glucopyranosides possess antioxidant properties that may be the reason for the liver protective effects.



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## Cruciferous vegetables

Studies that are done with cruciferous vegetables have shown promising liver protective effects as well. These vegetables contain myrosinase, a compound that protects the plant against herbivores. Metabolites from myrosinase like sulforaphane increase the expression of detoxification enzymes. Brussels sprouts, broccoli sprout extract and mustard greens in particular have been studied the most.

PMID: [20722931](#) PMID: [21535814](#)



## Dandelion Root & Leaf

Dandelion has been frequently used to prevent or treat different liver diseases because of its rich composition in phytochemicals with demonstrated effect against hepatic injuries. Studies have shown that the root has some polyphenols that could protect the liver. The leaf of dandelion reduces oxidative stress and the damage to liver cells from it.

PMID: [28841174](#) PMID: [25270677](#)

[Hepatoprotection by dandelion \(Taraxacum officinale\) and mechanisms](#)



## Drumstick leaves

**Parts used in research:** pod, leaves

**Liver-toxic substances used in research:** carbon tetrachloride, paracetamol

The liver protective compounds in drumstick leaves have been attributed to the presence of phenols and flavonoids. Interesting to note that drumstick leaves are particularly rich in quercetin as well. The amount of quercetin in drumstick leaves is about 180 mg/100 gram. Compare this to the amount of quercetin in onions which is 300 mg/kg!



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## Fatty fish

**Parts used in research:** fish oil

**Liver-toxic substances used in research:** none

EPA and DHA, two types of fatty acids belonging to the omega 3 family, have been shown to protect against free radicals by increasing the body's production of superoxide dismutase (SOD) and the antioxidant enzyme glutathione. Liver enzymes which are important to break down foreign substances (To be specific: CYP1A1, CYP3A1 and CYP2E1) were increased as well.

PMID: [12575903](#)



## Garlic

**Parts used in research:** bulbs

**Liver-toxic substances used in research:** lead, paracetamol

Garlic supplements in combination with vitamin C have been shown effective against lead-induced liver damage. Similar studies were done on liver damage from paracetamol. Treatment increased Glutathione in the liver together with the antioxidant enzymes SOD (Superoxide Dismutase) and Catalase.

## Grapefruit

**Parts used in research:** fruit

**Liver-toxic substances used in research:** Alcohol, dimethylnitrosamine (is used to make rocket fuel)

Grapefruit contains significant levels of vitamin C, folic acid, phenolic acid, potassium, calcium, iron, limonoids, terpenes, monoterpenes, and D-glucaric acid. The flavonoid that has the greatest concentration is naringin, which humans metabolize into naringenin. Naringenin possesses the ability to inhibit oxidative stress and inflammation and has been shown to display hepatoprotective properties.

PMID: [25356040](#)



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## Grapes

**Parts used in research:** fruit

**Liver-toxic substances used in research:** Carbon tetrachloride, Arsenic Trioxide

Especially red and purple grapes contain a variety of phytochemicals that have health benefits. Resveratrol is the most famous one. Resveratrol has been shown to increase enzymes (catalase and superoxide dismutase) that reduce oxidative stress. Resveratrol reduces liver injury markers.

PMID: [34935193](#), PMID: [19627194](#)



## Extra Virgin Olive Oil (EVOO)

**Parts used in research:** EVOO

**Liver-toxic substances used in research:** carbon tetrachloride  
EVOO is rich in antioxidants like vitamin E and polyphenols. Because EVOO has a lot of different antioxidants it is hard to tell which antioxidant contributes the most to the liver-protecting effect. The more bitter and peppery the taste of the olive oil, the more polyphenols the oil has.

PMID: [34925810](#)

## Kidney beans

**Parts used in research:** seeds

**Liver-toxic substances used in research:** carbon tetrachloride, alcohol, paracetamol and Thioacetamide (used in the paper, textile and leather industry)

Kidney beans have been shown to protect the liver against damage from different Liver-toxic substances. After poisoning with carbon tetrachloride, kidney beans prevented the formation of scar tissue (made from collagen) in research.

PMID: [18626430](#)



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## Lemon

**Parts used in research:** fruit

**Liver-toxic substances used in research:** carbon tetrachloride, acetaminophen

Ethanol extracts of lemon fruit significantly reduced elevated liver enzymes, total and direct bilirubin caused by carbon tetrachloride intoxication. It improved glutathione levels and raised the levels of SOD(Superoxide Dismutase) and Catalase. Studies have also shown that Citrus Bergamia (Bergamot Orange) provides protection to the liver by acetaminophen-induced liver damage.



## Milk thistle

**Parts used in research:** leaves

**Liver-toxic substances used in research:** ethanol, acetaminophen and carbon tetrachloride

This plant contains at least seven flavoligands and the flavonoid taxifolin. The ability of milk thistle to inhibit free radical formation offers protection to the liver. Milk thistle can enhance the production of glutathione in the liver.

PMID: [24672644](#)



## Mint

**Parts used in research:** leaves

**Liver-toxic substances used in research:** carbon tetrachloride, alcohol

The flavonoids in water extracts of mint leaves have been shown to reduce liver damage from alcohol and carbon tetrachloride. Several flavonoids, primarily eriocitrin, luteolin and hesperidin have been shown to have anti-inflammatory effects.

PMID: [16767798](#)



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## Mustard plant

**Parts used in research:** leafs

**Liver-toxic substances used in research:** carbon tetrachloride

The presence of terpenoids and flavonoids might be the reason for the liver protective effects of mustard. In research, mustard leaf extract has been shown to reverse liver damage from carbon tetrachloride, a compound that has been used in products like fire extinguishers, containers, spot removers and cleaning agents. Its use has been reduced, but traces are still found in the air and in drinking water. Carbon tetrachloride is also still used in industrial chemicals.



## Onions

**Parts used in research:** bulbs, tender leaves

**Liver-toxic substances used in research:** cadmium, paracetamol, carbon tetrachloride

Alcohol and water extracts from onions have been used in studies to investigate the therapeutic effect of onions on the liver. Onions contain saponins, flavonoids and other compounds that have been shown to reduce liver-damaging free radicals.

## Radish

**Parts used in research:** root

**Liver-toxic substances used in research:** paracetamol

Radish has antioxidants such as glucosinolate and isothiocyanate that may have liver-protecting effects. These antioxidants have been shown to activate Nrf2, increase glutathione and lower elevated liver enzymes as a result of liver damage.

PMCID: [PMC9737327](https://pubmed.ncbi.nlm.nih.gov/PMC9737327/)



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## Tomato

**Parts used in research:** fruits (pulp)

**Liver-toxic substances used in research:** carbon tetrachloride

Eating tomato pulp before carbon tetrachloride poisoning prevented damage to the liver. Which compound was responsible is unclear. But in tomatoes, you can find some plant chemicals that have been shown to protect the liver in other studies like kaempferol and naringin.

PMID: [16896233](#)



## Turmeric

**Parts used in research:** bulbs, tender leaves

**Liver-toxic substances used in research:** carbon tetrachloride

Administration of water-soluble extracts of turmeric have been shown to decrease elevated bilirubin and other enzymes that elevate because of liver damage (SGOT and SGPT if you like to know). It also increased the intracellular killing capacity of macrophages.

## Turnips

**Parts used in research:** root

**Liver-toxic substances used in research:** paracetamol

Just like radishes, turnips contain the antioxidants glucosinolate and isothiocyanate and have been shown to activate the Nrf2 pathway, increase glutathione production and lower elevated liver enzymes as a result of liver damage.

PMCID: [PMC9737327](#)



## Winter Melon

**Parts used in research:** fruits

**Liver-toxic substances used in research:** diclofenac, sodium, nimesulide (NSAID)

Winter melon contains vitamin E, beta-carotene, flavonoids and flavonols. These compounds have been shown to protect the liver against damage from different compounds by increasing glutathione, catalase and SOD(Superoxide Dismutase)

**Other research sources:**

<https://www.researchgate.net/publication/282651328> A Review on Hepatoprotective Activity of Commonly Consumed Vegetables

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## Foods that support bile production and bile flow

Bile flow is incredibly important to health. Bile helps to modulate the pH in the intestines which is important for what bacteria strains can grow in your intestine. Bile helps emulsify fats and is needed for nutrient absorption. In bile there is also cholesterol. When bile flows, cholesterol can bind to fiber and leave the body. Bile also excretes bilirubin, a breakdown product of old dead red blood cells. Bilirubin is also what gives stool its brown color. Elevated serum bilirubin could mean your liver & gallbladder need some love.

The following list of foods can increase bile production (also called choleretics) and stimulate bile flow (also called cholagogues):

## Foods that stimulate bile production (Choleretics)

Food	Compound	Suggested Use	Source
Potatoes	Trypsin	Cooked	<a href="#">PMID: 20820171</a>
Fish	DHA	Cooked	<a href="#">PMID: 22313587</a>
Oatmeal	beta-glucan	Porridge, overnight oats	<a href="#">PMID: 26724486</a> , <a href="#">PMID: 22187640</a>
Orange Peel	D-Limonene	Grated in sauces, salad dressings and curries	<a href="#">PMID: 25499726</a>
Olive Oil	Oleic Acid	Salads	<a href="#">PMID: 22313587</a>
Artichoke	Luteolin, chlorogenic acid, and cynaroside, silymarin	Salads, soups	<a href="#">PMID: 26310198</a>
Red Kidney Beans	Phytohemagglutinin	Salads, cooked	<a href="#">PMID: 18248661</a>
Dandelion	Chicory acid	Salads, cooked	<a href="#">PMID: 28012278</a> , <a href="#">PMID: 9772143</a>
Turmeric	Bisacurone B ,ar-turmerone, bisdemethoxycurcumin demethoxycurcumin, curcumin, para-tolilmethylcarbinol	Curry's, tea, juices, spice	<a href="#">PMID: 27228476</a> , <a href="#">PMID: 24409053</a>

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Food	Compound	Suggested Use	Source
Chicory	Chicory acid	Salad, cooked	<a href="#">PMID: 9772143</a>
Burdock root	Not available	Roasted, sauteed, stir fried	
Peppermint	Menthol, menthone, isomenthone, D-Limonene	Salads, tea, home made pesto's, curries	<a href="#">PMID: 25499726</a>
Licorice	Liquiritigenin	Tea	<a href="#">PMID: 19074639</a>
Lemon peel	D-Limonene	Grated in sauces, salad dressings and curries	<a href="#">PMID: 25499726</a>
Grapefruit peel	D-Limonene	Grated in sauces, salad dressings and curries	<a href="#">PMID: 25499726</a>
Cinnamon	Cinnamic acid	Tea, spice	<a href="#">PMID: 13650735</a>
Oregon grape	Berberine	Juice, raw	<a href="#">PMID: 36093200</a>
Milk Thistle	Silymarin	Tea	<a href="#">PMID: 10692567</a>

## Other sources:

Burdock: <https://www.sciencedirect.com/topics/medicine-and-dentistry/arctium>

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## Foods that stimulate bile production (Choleretics)

Food	Cholagogue & Choleretic Compound	Suggested Use
Peppermint	Menthol, menthone, isomenthone	Salads, tea, home made pesto's, curries
Clove	Eugenol, acetyeugenol	Spice, tea and in coffee
Coffee bean	Caffeine, caffeic acid	Coffee
Tea plant	Theophylline	Tea
Licorice	Glycyrrhizinic acid and derivatives	Tea
Chinese Licorice	Liquiritigenin	Tea
Chamomile	Chamiloflan	Tea
Ginger	Gingerol	Tea, Curry, sauces and juices
Yarrow	Dicaffeoylquinic acids	Tea, Salads, omelets, soupe
Milk Thistle (seeds)	Silymarin, silibinin	Tea
King Of Bitters	Andrographolide	Tea, Salad
Mugwort	4-Hydroxyacetophenone	Salad, stir fry
Dandelion	sesquiterpenes	Salad, cooked
Artichoke	Cynarin, cynaropicrin, chlorogenic acid, and cynaroside, silymarin	Salad, soups, cooked
Turmeric	feluric and hydrofeluric acids	Curry's, tea, juices, spice
Burdock Root	Not available	Roasted, sauted, stirfried
Fenugreek	Not available	Tea, spice

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## Sources:

<https://www.sciencedirect.com/topics/medicine-and-dentistry/cholagogue>

[https://www.researchgate.net/publication/233814241\\_Mechanisms\\_of\\_Action\\_of\\_Herbal\\_Cholagogues](https://www.researchgate.net/publication/233814241_Mechanisms_of_Action_of_Herbal_Cholagogues)

<https://encyclopedia.pub/entry/25769>

**Cyrcumin:** [PMID: 24409053](#)

**D-Limonene:**

[https://www.ncbi.nlm.nih.gov/books/NBK513608/#:~:text=The%20principal%20sources%20of%20d,trade%20\(Gerow%2C%201974\).](https://www.ncbi.nlm.nih.gov/books/NBK513608/#:~:text=The%20principal%20sources%20of%20d,trade%20(Gerow%2C%201974).)

**Burdock:** <https://www.sciencedirect.com/topics/medicine-and-dentistry/arctium>

**Tea plant:**

[https://www.researchgate.net/publication/349313028\\_Choleretic\\_and\\_cholagogic\\_effects\\_of\\_an\\_ti-cholelithiatic\\_plants](https://www.researchgate.net/publication/349313028_Choleretic_and_cholagogic_effects_of_an_ti-cholelithiatic_plants)

**Fenugreek:** <https://pubmed.ncbi.nlm.nih.gov/21756271/>

**List of cholagogic plants with their bioactive compounds:**

<https://www.semanticscholar.org/paper/Mechanisms-of-Action-of-Herbal-Cholagogues-Spiridonov/07979cc6cb4a90a54046d2af5f69f8adc6698dfe>